C3. CHAPTER 3
HAZARD CLASSIFICATION, STORAGE AND COMPATIBILITY PRINCIPLES, AND MIXING RULES

C3.1. HAZARD CLASSIFICATION

To ease identification of hazard characteristics for storage and transportation, the Department of Defense shall use:

C3.1.1. DoD Ammunition and Explosives Hazard Classification Procedures as a basis for assigning hazard classifications to all AE for both storage and transportation applications. (See Technical Bulletin (TB) 700-2, Naval Sea Systems Command Instruction (NAVSEAINST) 8020.8B, Technical Order (TO) 11A-1-47, Defense Logistics Agency Regulation (DLAR) 8220.1 (Reference (d)).

C3.1.2. The applicable Department of Transportation (DoT) hazardous materials regulations per 49 Code of Federal Regulations (CFR) parts 171 to 177 (Reference (e)).

C3.1.3. The United Nations' (UN) international system of classification developed for the transport of dangerous goods. See ST/SG/AC.10 (Reference (f)).

C3.2. DOD HAZARD CLASSIFICATION SYSTEM

C3.2.1. The DoD hazard classification system consists of nine hazard classes plus a non-regulated category that applies when explosives and hazardous materials are present in an item, but not to the degree that criteria for assignment to one of the nine classes are met. AE is assigned to the class that represents an item's predominant hazard characteristic. Class 1 applies to AE where the explosive hazard predominates. The six Class 1 divisions, and three division 1.2 subdivisions (subdivisions are only applicable for storage applications), which are outlined below, are used to indicate the character and predominance of explosive hazards. In addition to the classes, divisions, subdivisions, and the non-regulated category, thirteen Compatibility Groups (CG) are used for segregating AE on the basis of similarity of function, features, and accident effects potential. Furthermore, a parenthetical number is also used to indicate the minimum separation distance (in hundreds of feet) for protection from debris, fragments, and firebrands, when distance alone is relied on for such protection. This number is placed to the left of the hazard classification designators 1.1 through 1.3 (e.g., (18)1.1, (08)1.2.3, or (02)1.3). To simply express an item's hazard classification, this Standard uses the term "Hazard Division (HD)" to avoid repeatedly using the more cumbersome terminology "Subdivision X of Division Y of Class Z." The six Class 1 divisions and three hazard subdivisions are:

C3.2.1.1. Mass explosion (HD 1.1).

C3.2.1.2. Non-mass explosion, fragment producing (HD 1.2). (See paragraph C9.4.2.)

C3.2.1.2.1. HD 1.2.1. Those items with a NEWQD > 1.60 pounds [0.73 kg] or that exhibit fragmentation characteristics similar to or greater than (higher density, longer distance) M1 105 mm projectiles regardless of NEWQD.

C3.2.1.2.2. HD 1.2.2. Those items with an NEWQD $\leq$ 1.60 pounds [0.73 kg] or that at most exhibit fragmentation characteristics similar to high-explosive 40 mm ammunition regardless of NEWQD.

C3.2.1.2.3. HD 1.2.3. AE that exhibits at most an explosion reaction in the sympathetic reaction test, and no reaction more severe than burning in the liquid fuel/external fire test, bullet impact test, and slow heating test.

C3.2.1.3. Mass fire, minor blast or fragment (HD 1.3).

C3.2.1.4. Moderate fire, no significant blast or fragment (HD 1.4).

C3.2.1.5. Explosive substance, very insensitive (with mass explosion hazard) (HD 1.5).

C3.2.1.6. Explosive article, extremely insensitive (no mass explosion hazard) (HD 1.6).

C3.2.2. Storage and Transportation CG

C3.2.2.1. The thirteen CG assigned to AE based on similarity of function, features, and accident effects potential are:

C3.2.2.1.1. Group A. Initiating (primary) explosives. Bulk initiating explosives that have the necessary sensitivity to heat, friction, or percussion to make them suitable for use as initiating elements in an explosive train. Examples include the following: bulk lead azide, lead styphnate, mercury fulminate, tetracene, dry cyclotrimethylenetrinitramine (RDX) (also known as cyclonite, hexogen, or Royal Demolition Explosive), and dry pentaerythritol tetranitrate (PETN).

C3.2.2.1.2. Group B. Detonators and similar initiating devices not containing two or more effective protective features. Items containing initiating (primary) explosives that are designed to initiate or continue the functioning of an explosive train. Examples include the following: detonators, blasting caps, small arms primers, and fuzes.

C3.2.2.1.3. Group C. Bulk propellants, propelling charges, and devices containing propellant with, or without, its own means of ignition. Examples include the following: bulk single-, double-, or triple-base, and composite propellants, rocket motors (solid propellant), and propelled AE with inert projectiles.

C3.2.2.1.4. Group D. Bulk black powder; bulk HE (secondary explosives); and AE without a propelling charge, but containing HE (secondary explosives) without its own means of initiation, i.e., no initiating device is present or the device has two or more effective protective features. Examples include the following: bulk trinitrotoluene (TNT), Composition B, and black

powder; bulk wet RDX or PETN; bombs, projectiles, Cluster Bomb Units (CBU), depth charges, and torpedo warheads.

C3.2.2.1.5. Group E. AE containing HE (secondary explosives) without its own means of initiation and either containing, or with, a solid propelling charge. Examples include the following: artillery AE, rockets, and guided missiles.

C3.2.2.1.6. Group F. AE containing HE (secondary explosives) with its own means of initiation, i.e., the initiating device present has less than two effective protective features, and with or without a solid propelling charge. Examples include the following: grenades, sounding devices, and similar items having explosive trains with less than two effective protective features.

C3.2.2.1.7. Group G. Illuminating, incendiary, and smoke- (including hexachlorethane (HC)) or tear-producing AE, excluding those that are water-activated or that contain white phosphorus (WP) or a flammable liquid or gel. Examples include the following: flares, signals, and pyrotechnic substances.

C3.2.2.1.8. Group H. AE containing WP. AE in this group contains fillers that are spontaneously flammable when exposed to the atmosphere. Examples include the following: WP and plasticized white phosphorus (PWP).

C3.2.2.1.9. Group J. AE containing flammable liquids or gels other than those that are spontaneously flammable when exposed to water or the atmosphere. Examples include the following: liquid- or gel-filled incendiary AE, Fuel-Air Explosive (FAE) devices, and flammable liquid-fueled missiles and torpedoes.

C3.2.2.1.10. Group K. AE containing toxic chemical agents. AE in this group contain chemicals specifically designed for incapacitating effects more severe than lachrymation (tear-producing). Examples include the following: artillery or mortar AE (fuzed or unfuzed), grenades, rockets and bombs filled with a lethal or incapacitating chemical agent. (See note 4, Table C3.T1.)

C3.2.2.1.11. Group L. AE not included in other CG, having characteristics that present a special risk that does not permit storage with other types of AE, or other kinds of explosives, or dissimilar AE of this group. Examples include the following: water-activated devices, pyrophorics and phosphides and devices containing these substances, prepackaged hypergolic liquid-fueled rocket engines, triethyl aluminum (TEA), thickened TEA (TPA), and damaged or suspect AE of any group. Different types of AE in CGL presenting similar hazards may be stored together.

C3.2.2.1.12. Group N. AE containing only Extremely Insensitive Detonating Substances (EIDS). An example is HD 1.6 AE.

C3.2.2.1.13. Group S. AE that presents no significant hazard, packaged or designed so that any hazardous effects from accidental functioning are limited to the extent that they do

not significantly hinder firefighting. Examples include the following: explosive switches or valves and small arms ammunition.

C3.2.3. Sensitivity Groups (SG). For the purpose of storage within a HPM (see paragraph C3.3.7.) or where ARMCO, Inc. revetments (see paragraph C5.3.5.) or Substantial Dividing Walls (SDW) are utilized to reduce MCE, each HD 1.1 and HD 1.2 AE item is designated, based on its physical attributes, into one of five SG. Directed energy weapons are further identified by assigning the suffix "D" following the SG designation (e.g., SG2D). The SG assigned to an HD 1.1 and HD 1.2 AE item is found in the Joint Hazard Classification System (JHCS).

C3.2.3.1. The five SG, in relative order from least sensitive to most sensitive, are:

C3.2.3.1.1. SG 2: Non-robust or thin-skinned AE (see glossary).

C3.2.3.1.2. SG 1: Robust or thick-skinned AE. A SG 1 item meets any two of the following criteria:

C3.2.3.1.2.1. Ratio of explosive weight to empty case weight < 1.

C3.2.3.1.2.2. Minimum case thickness > 0.4 inches [1 cm].

C3.2.3.1.2.3. Ratio of case thickness to $NEWQD^{1/3}$ > 0.05 $in/lb^{1/3}$ [0.165 $cm/kg^{1/3}$].

C3.2.3.1.3. SG 3: Fragmenting AE. These items, which are typically air-to-air missiles, have warhead cases designed for specific fragmentation (e.g., pre-formed fragment warhead, scored cases, and continuous rod warheads).

C3.2.3.1.4. SG 4: Cluster bombs/dispenser munitions.

C3.2.3.1.5. SG 5: Other AE (items for which HPM non-propagation walls are not effective). Items are assigned to SG 5 because they are either very sensitive to propagation or their sensitivity has not been determined.

C3.2.3.2. Item-specific testing or analyses can be used to change an item's SG.

C3.3. STORAGE AND COMPATIBILITY PRINCIPLES

C3.3.1. Separate storage of AE by HD and type provides the highest degree of safety. Because such storage is generally not feasible, mixed storage—subject to compliance with these Standards—is normally implemented when such storage facilitates safe operation and promotes overall storage efficiency.

C3.3.2. The CG assigned to AE indicates what it can be stored with or without significantly increasing either an accident's probability or, for a given quantity, the magnitude of an accident's effects. Only compatible AE will be stored together.

C3.3.3. AE may not be stored with dissimilar substances or articles (e.g., flammable or combustible materials, acids, or corrosives) that may present additional hazards to the AE unless they have been assessed to be compatible. Non-Regulated AE and AE assigned to Classes 2 through 9 may have a CG assigned. When so assigned, the AE may be stored in an explosives magazine in accordance with the CG. The explosive weight of non-regulated AE and AE assigned to Classes 2 through 9 is not considered for QD purposes.

C3.3.4. The DoD hazard classification system classifies articles that contain riot control substances, without explosives components, and bulk toxic chemical agents as HD 6.1.

C3.3.5. AE in damaged packaging, in a suspect condition, or with characteristics that increase risk in storage, are not compatible with other AE and will be stored separately (in CG L).

C3.3.6. If different types of CG N munitions are mixed together and have not been tested to ensure non-propagation, the mixed munition types are individually considered to be HD 1.2.1 D or HD 1.2.2 D based on their NEWQD or overriding fragmentation characteristics.

C3.3.7. High Performance Magazine. Because of its construction (see paragraph C5.2.4.), each HPM storage cell is treated as a separate magazine for the purposes of meeting compatibility and mixing requirements. Within a HPM cell, all current compatibility and mixing regulations apply. The maximum allowable NEWQD is 30,000 lbs [13,608 kg] in a HPM cell and 60,000 lbs [27,215 kg] in the loading dock with the following restraints:

C3.3.7.1. When SG 1, 2, or 3 AE is present in a HPM cell, the allowable NEWQD in all cells (adjacent, across, and diagonal) and in the loading dock remains the maximum.

C3.3.7.2. When SG 4 AE is present in a HPM cell, the allowable NEWQD in each adjacent cell and in the cell directly across from it is reduced to 15,000 lbs [6,804 kg]. The allowable NEWQD in diagonal cells and in the loading dock remains the maximum.

C3.3.7.3. When SG 5 AE is present in a HPM, the NEWQD of all cells and the loading dock must be summed for quantity-distance purposes.

C3.3.7.4. When directed energy weapons are present in a HPM, they must be oriented in such a manner that if initiation were to occur, the consequences would be directed away from any other cell. Otherwise, the NEWQD of all cells and the loading dock must be summed for quantity-distance purposes.

C3.3.7.5. When HD and SG are mixed within a HPM cell, the most sensitive SG associated with the AE in that cell controls the allowable NEWQD in each adjacent cell. For

example, when HD 1.3, HD 1.4 and HD 1.6 items are stored with HD 1.1 or HD 1.2 items, the most sensitive SG of the HD 1.1 and HD 1.2 items controls the storage requirements.

C3.4. MIXED COMPATIBILITY GROUP STORAGE

C3.4.1. AE of different CG may only be mixed in storage as indicated in Table C3.T1. The exceptions are when Chapter 10 is being applied, and at specific continental United States (CONUS) locations that a DoD Component designates to store AE packaged and configured for rapid response (e.g., Rapid Deployment Force) for which the DDESB has approved the site plan. Such designated locations are authorized to mix CG, without complying with the compatibility and mixing requirements, as operationally required to achieve the optimum load needed by the intended receiving troops. The MCE allowable at any of these storage sites shall be limited to 8,818 lbs NEWQD [4,000 kg NEQ]. When computing QD requirements for such sites, Chapter 9 applies. However, the following AE will be excluded for NEWQD determination at such storage sites:

C3.4.1.1. Propelling charges in HD 1.2 fixed, semi-fixed, mortar, and rocket AE (see glossary).

C3.4.1.2. The NEWQD of HD 1.3 items, except at sites that contain only HD 1.3 items. At such sites, HD 1.3 QD applies. (NOTE: In the application of this paragraph to separate loading AE, the explosive weight of propelling charges is generally excluded when matched pairs of projectiles and propelling charges are at the site. However, if the quantity of propelling charges at the site exceeds the maximum usable for the quantity of projectiles at the site, the explosive weights of all propelling charges and projectiles at the site must be summed for NEWQD determination.)

Table C3.T1. Storage Compatibility Mixing Chart

CG	A	B	C	D	E	F	G	H	J	K	L	N	S
A	X	Z											
B	Z	X	Z	Z	Z	Z	Z					X	X
C		Z	X	X	X	Z	Z					X	X
D		Z	X	X	X	Z	Z					X	X
E		Z	X	X	X	Z	Z					X	X
F		Z	Z	Z	Z	X	Z					Z	X
G		Z	Z	Z	Z	Z	X					Z	X
H								X					X
J									X				X
K										Z			
L													
N		X	X	X	X	Z	Z					X	X
S		X	X	X	X	X	X	X	X			X	X

Notes for Table C3.T1.:

1 An "X" at an intersection indicates that the groups may be combined in storage. Otherwise, mixing is either prohibited or restricted per Note 2.

2 A "Z" at an intersection indicates that when warranted by operational considerations or magazine non-availability, and when safety is not sacrificed, mixed storage of limited quantities of some items from different groups may be approved by the DoD Components. Such approval documentation must be kept on site. Component approval of mixed storage in compliance with Z intersections does not require a waiver or exemption. Mixed storage of items within groups where no X or Z exists at that pair's intersection beyond the prohibitions and limitations of Note 7, however, requires an approved waiver or exemption. Examples of acceptable storage combinations are:
   a. HD 1.1A initiating explosives with HD 1.1B fuzes not containing two or more effective protective features.
   b. HD 1.3C bulk propellants or bagged propelling charges with HD 1.3G pyrotechnic substances.

3 Equal numbers of separately packaged components of hazard-classified complete rounds of any single type of AE may be stored together. When so stored, compatibility is that of the complete round.

4 CG K requires not only separate storage from other groups, but also may require separate storage within the group. The controlling DoD Component will determine which items under CG K may be stored together and those that must be stored separately. Such documentation must be kept on site.

5 AE classed outside Class 1 may be assigned the same CG as Class 1 AE containing similar hazard features, but where the explosive hazard predominates. Non-Class 1 AE and Class 1 AE assigned the same CG may be stored together.

6 The DoD Components may authorize AE-designated "Practice" or "Training" by nomenclature, regardless of the CG assigned, to be stored with the tactical AE it simulates. Such documentation must be kept on site.

7 The DoD Components may authorize the mixing of CG, except items in CG A, K and L, in limited quantities generally of 1,000 lb [454 kg] total NEWQD or less. Such documentation must be kept on site.

8 For purposes of mixing, all AE must be packaged in its standard storage and shipping container. AE containers will not be opened for issuing items from storage locations. Outer containers may be opened in storage locations for inventorying and for magazines storing only HD 1.4 items, unpacking, inspecting, and repackaging the HD 1.4 ammunition.

9 When using the "Z" mixing authorized by Note 2 for articles of either CG B or CG F, each will be segregated in storage from articles of other CG by means that prevent propagation of CG B or CG F articles to articles of other CG.

10 If dissimilar HD 1.6N AE are mixed together and have not been tested to ensure non-propagation, the mixed AE are individually considered to be HD 1.2.1 D or HD 1.2.2 D based on their NEWQD or overriding fragmentation characteristics for purposes of transportation and storage. When mixing CG N AE with CG B through CG G or with CG S, see subparagraphs C9.2.2.1.1., C9.2.2.4., C9.2.2.10., and C9.2.2.11. to determine the HD for the mixture.